

SUBSTITUTE SEQUENCE LISTING

<110> Cahoon, Rebecca E.
Miao, Guo-Hua
Herrman, Rafael
Rafalski, Antoni
McCutchen, Bill F.

<120> Plant Protein Disulfide Isomerases

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<140> 09/417,251

<141> 1999-10-13

<150> 60/049,408

<151> 1998-10-15

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<212> DNA

<213> Zea mays

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Val Leu Ala Glu Phe Phe Ala Pro Trp Cys Gly His Cys Lys Ala Leu
          35          40          45
Ala Pro Glu Tyr Glu Glu Ala Ala Thr Thr Leu Lys Glu Lys Asn Ile
          50          55          60
Lys Leu Ala Lys Ile Asp Cys Thr Glu Glu Ser Asp Leu Cys Lys Asp
          65          70          75          80
Gln Gly Val Glu Gly Tyr Pro Thr Leu Lys Val Phe Arg Gly Leu Asp
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Asn Val Thr Pro Tyr Ser Gly Gln Arg Lys Ala Ala Gly Ile
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Gly Tyr Val Asp Gly Thr Leu Gln Pro Thr Val Lys Ser Glu Glu Ile
          35          40          45
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Pro Glu Lys Gln Asp Gly Pro Val Tyr Val Leu Val Gly Lys Asn Phe
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Glu Ser Ile Val Met Asp Glu Thr Lys Asp Val Leu Val Glu Phe Tyr
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Ala Pro Trp Cys Gly His Cys Lys Thr Leu Ala Pro Lys Tyr Asp Ala
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Leu Gly Glu Ser Phe Lys Ser Asn Pro Asn Val Ile Ile Ala Lys Ile
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Asp Ala Thr Ala Asn Asp Thr Pro Val Asp Ile Gln Gly Phe Pro Thr
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<212> PRT

<213> Zea mays

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 35 40 45

Ala Ala Leu Gly Ala Ile Asp Phe Leu Phe Val Asp Phe Tyr Ala Pro
 50 55 60

Trp Cys Gly His Cys Lys Arg Leu Ala Pro Glu Leu Asp Glu Ala Ala
 65 70 75 80

Pro Val Leu Ser Gly Leu Ser Glu Pro Ile Val Val Ala Lys Val Asn
 85 90 95

Ala Asp Lys Tyr Arg Lys Leu Gly Ser Lys Tyr Gly Val Asp Gly Phe
 100 105 110

Pro Thr Leu Met Leu Phe Ile His Gly Val Pro Ile Glu Tyr Thr Gly
 115 120 125

Ser Arg Lys Ala Asp Gln Leu Val Arg Asn Leu Lys Lys Phe Val Ser
 130 135 140

Pro Asp Val Ser Ile Leu Glu Ser Asp Ser Ala Ile Lys Asn Phe Val
 145 150 155 160

Glu Asn Ala Gly Ile Ser Phe Pro Ile Phe Leu Gly Phe Gly Val Asn
 165 170 175

Asp Ser Leu Ile Ala Glu Tyr Gly Arg Lys Tyr Lys Lys Arg Ala Trp
 180 185 190

Phe Ala Val Ala Lys Asp Phe Ser Glu Asp Ile Met Val Ala Tyr Glu
 195 200 205

Phe Asp Lys Val Pro Ala Leu Val Ala Ile His Pro Lys Tyr Lys Glu
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Gln Ser Leu Phe Tyr Gly Pro Phe Glu Glu Asn Phe Leu Glu Asp Phe
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Val Arg Gln Ser Leu Leu Pro Leu Val Val Pro Ile Asn Thr Glu Thr
 245 250 255

Leu Lys Met Leu Asn Asp Asp Gln Arg Lys Val Val Leu Thr Ile Leu
 260 265 270

Glu Asp Asp Ser Asp Glu Asn Ser Thr Gln Leu Val Lys Ile Leu Arg
 275 280 285

Ser Ala Ala Asn Ala Asn Arg Asp Leu Val Phe Gly Tyr Val Gly Ile
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Lys Gln Trp Asp Gly Phe Val Glu Thr Phe Asp Val Ser Lys Ser Ser
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 Gln Leu Pro Lys Leu Leu Val Trp Asp Arg Asp Glu Glu Tyr Glu Leu
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 Val Asp Gly Ser Glu Arg Leu Glu Glu Gly Asp Gln Ala Ser Gln Ile
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 Ser Gln Phe Leu Glu Gly Tyr Arg Ala Gly Arg Thr Thr Lys Lys Lys
 355 360 365
 Ile Thr Gly Pro Ser Phe Met Gly Phe Leu Asn Ser Leu Val Ser Leu
 370 375 380
 Asn Ser Leu Tyr Ile Leu Ile Phe Val Ile Ala Leu Leu Phe Val Met
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 <212> DNA
 <213> Momordica charantia

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1774

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<211> 541

<212> PRT

<213> Momordica charantia

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Asp Phe Ser Asp Phe Glu Asp Ser Asp Ala Asp Arg Asp Glu Tyr Lys
 35 40 45

Ala Pro Glu Val Asp Glu Lys Asp Val Val Val Leu Lys Glu Gly Asn
 50 55 60

Phe Ser Asp Phe Val Glu Lys Asn Arg Phe Val Met Val Glu Phe Tyr
 65 70 75 80

Ala Pro Trp Cys Gly His Cys Gln Ala Leu Ala Pro Glu Tyr Ala Ala
 85 90 95

Ala Ala Thr Glu Leu Lys Gly Glu Asn Val Val Leu Ala Lys Val Asp
 100 105 110

Ala Thr Glu Glu Asn Glu Leu Ser Gln Lys Tyr Asp Val Gln Gly Phe
 115 120 125

Pro Thr Val Tyr Phe Phe Ala Asp Gly Val His Lys Ser Tyr Pro Gly
 130 135 140

Gln Arg Thr Lys Asp Ala Ile Val Thr Trp Ile Lys Lys Lys Ile Gly
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Pro Gly Ile Tyr Asn Ile Thr Ser Val Glu Asp Ala Glu Arg Ile Leu
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Thr Ser Glu Thr Lys Val Val Leu Gly Tyr Leu Asn Ser Leu Val Gly
 180 185 190

Pro Glu Ser Asn Glu Leu Ala Ala Ala Ser Arg Leu Glu Asp Asp Val
 195 200 205

Asn Phe Tyr Gln Thr Val Asp Pro Glu Val Ala Lys Leu Phe His Ile
 210 215 220

Glu Ala Ser Ala Lys Arg Pro Ala Leu Val Leu Leu Lys Lys Glu Ala
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Glu Lys Leu Asn Arg Phe Asp Gly Glu Phe Ser Lys Ser Ala Ile Ala
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Glu Phe Val Phe Ala Asn Lys Leu Pro Leu Val Thr Lys Phe Thr Arg
 260 265 270

Glu Ser Ala Pro Leu Ile Phe Glu Ser Ser Ile Lys Lys Gln Leu Ile
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 Ser Gly Asn Gly Pro Glu Val Leu Gly Tyr Thr Gly Asn Glu Asp Ser
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 Asp Pro Ile Pro Glu Thr Asn Asp Gly Asp Val Lys Val Val Val Gly
 385 390 395 400
 Asp Asn Phe Asp Asn Ile Val Leu Asp Glu Ser Lys Asp Val Leu Leu
 405 410 415
 Glu Ile Tyr Ala Pro Trp Cys Gly His Cys Gln Ala Leu Glu Pro Thr
 420 425 430
 Tyr Asn Lys Leu Ala Lys His Leu Arg Gly Ile Asp Ser Leu Val Ile
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 Ala Lys Met Asp Gly Thr Thr Asn Glu His Pro Arg Ala Lys Ser Asp
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 Gly Phe Pro Thr Ile Leu Phe Phe Pro Ala Gly Asn Lys Ser Phe Asp
 465 470 475 480
 Pro Ile Thr Val Asp Thr Asp Arg Thr Val Val Ala Leu Tyr Lys Phe
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35 40 45
Ile Pro Thr Asn Asp Pro Asp Gly Trp Pro Glu Gly Asp Tyr Asp Asp
50 55 60
Asp Asp Leu Leu Phe Gln Asp Gln Asp Gln Asp Leu Thr Gly His Gln
65 70 75 80
Pro Glu Ile Asp Glu Thr His Val Val Val Leu Ala Ala Ala Asn Phe
85 90 95
Ser Ser Phe Leu Ala Ser Ser His His Val Met Val Glu Phe Tyr Ala
100 105 110

Pro Trp Cys Gly His Cys Gln Glu Leu Ala Pro Gly Leu Ser Arg Arg
 115 120 125
 Arg Ala His Leu Ala Gly Ser Thr Asn Gln Pro Arg Pro Asn Phe Ala
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 Leu Ala Lys Val Asp Ala Thr Glu Glu Thr Asp Leu Ala Gln Lys Tyr
 145 150 155 160
 Asp Val Gln Gly Phe Pro Thr Ile Leu Phe Phe Ile Asp Gly Val Pro
 165 170 175
 Arg Gly Tyr Asn Gly Ala Arg Thr Lys Glu Ala Ile Val Asp Trp Ile
 180 185 190
 Asn Lys Lys Leu Gly Pro Ala Val Gln Asn Val Thr Ser Val Asp Glu
 195 200 205
 Ala Gln Ser Ile Leu Thr Gly Asp Asp Lys Ala Val Leu Ala Phe Leu
 210 215 220
 Asp Thr Leu Ser Gly Ala His Ser Asp Glu Leu Ala Ala Ala Ser Arg
 225 230 235 240
 Leu Glu Asp Ser Ile Asn Phe Tyr Gln Thr Ser Thr Pro Asp Val Ala
 245 250 255
 Lys Leu Phe His Ile Asp Ala Ala Ala Lys Arg Pro Ser Val Val Leu
 260 265 270
 Leu Lys Lys Glu Glu Glu Lys Leu Thr Phe Tyr Asp Gly Glu Phe Lys
 275 280 285
 Ala Ser Ala Ile Ala Gly Phe Val Ser Ala Asn Lys Leu Pro Leu Val
 290 295 300
 Thr Thr Leu Thr Gln Glu Thr Ser Pro Ser Ile Phe Gly Asn Pro Ile
 305 310 315 320
 Lys Lys Gln Ile Leu Leu Phe Ala Val Ala Ser Glu Ser Thr Lys Phe
 325 330 335
 Leu Pro Ile Phe Lys Glu Ala Ala Lys Pro Phe Lys Gly Lys Leu Leu
 340 345 350
 Phe Val Phe Val Glu Arg Asp Ser Glu Glu Val Gly Glu Pro Val Ala
 355 360 365
 Asp Tyr Phe Gly Ile Thr Gly Gln Glu Thr Thr Val Leu Ala Tyr Thr
 370 375 380
 Gly Asn Glu Asp Ala Arg Lys Phe Phe Leu Asp Gly Glu Val Ser Leu
 385 390 395 400
 Glu Ala Ile Lys Asp Phe Ala Glu Gly Phe Leu Glu Asp Lys Leu Thr
 405 410 415
 Pro Phe Tyr Lys Ser Glu Pro Val Pro Glu Ser Asn Asp Gly Asp Val
 420 425 430

Lys Ile Val Val Gly Lys Asn Leu Asp Leu Ile Val Phe Asp Glu Thr
435 440 445

Lys Asp Val Leu Leu Glu Ile Tyr Ala Pro Trp Cys Gly His Cys Gln
450 455 460

Ser Leu Glu Pro Thr Tyr Asn Asn Leu Ala Lys His Leu Arg Ser Val
465 470 475 480

Asp Ser Leu Val Val Ala Lys Met Asp Gly Thr Thr Asn Glu His Pro
485 490 495

Arg Ala Lys Ser Asp Gly Tyr Pro Thr Ile Leu Phe Tyr Pro Ala Gly
500 505 510

Lys Lys Ser Phe Glu Pro Ile Thr Phe Glu Gly Glu Arg Thr Val Val
515 520 525

Asp Leu Tyr Lys Phe Ile Lys Lys His Ala Ser Ile Pro Phe Lys Leu
530 535 540

Lys Arg Gln Glu Ser Arg Thr Glu Ser Thr Arg Ala Glu Gly Val Lys
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Ser Ser Gly Thr Asn Ser Lys Asp Glu Leu
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<210> 11

<211> 891

<212> DNA

<213> Zea mays

<400> 11

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<210> 12

<211> 220

<212> PRT

<213> Zea mays

<400> 12

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Asn Asp Asp Gly Lys Lys Phe Val Leu Asp Gly Glu Val Thr Thr Asp
 35 40 45
 Lys Ile Lys Ala Phe Gly Glu Asp Phe Val Glu Asp Lys Leu Lys Pro
 50 55 60
 Phe Tyr Lys Ser Asp Pro Val Pro Glu Ser Asn Asp Gly Asp Val Lys
 65 70 75 80
 Ile Val Val Gly Asn Asn Phe Asp Glu Ile Val Leu Asp Glu Ser Lys
 85 90 95
 Asp Val Leu Leu Glu Ile Tyr Ala Pro Trp Cys Gly His Cys Gln Ser
 100 105 110
 Leu Glu Pro Ile Tyr Asn Lys Leu Ala Lys His Leu Arg Asn Ile Asp
 115 120 125
 Ser Leu Val Ile Ala Lys Met Asp Gly Thr Thr Asn Glu His Pro Arg
 130 135 140
 Ala Lys Pro Asp Gly Phe Pro Thr Leu Leu Phe Phe Pro Ala Gly Asn
 145 150 155 160
 Lys Ser Phe Asp Pro Ile Thr Val Asp Thr Asp Arg Thr Val Val Ala
 165 170 175
 Phe Tyr Lys Phe Leu Lys Lys His Ala Ser Ile Pro Phe Lys Leu Gln
 180 185 190
 Lys Pro Thr Ser Thr Ser Glu Ser Asp Ser Lys Gly Ser Ser Asp Ala
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 Lys Glu Ser Gln Ser Ser Asp Val Lys Asp Glu Leu
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<210> 13
 <211> 1126
 <212> DNA
 <213> Glycine max

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 ttgaaactct tcaagatgtt gcaaaaaacat tcaagtcaaa gataatgttt atatatgtgg 180
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 gaaaaacact taaccatgaa gaaagtaaaa cattatggaa agaaacaaat attatgtgt 840
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 atatgagtta gtcattatt atttgagtta gcttagtct aaattgcgaa agctagtcaa 960
 attataacat gtaatgaact acagaacata cttgatacac caaacattgt accgatcaac 1020

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actttccatt tgcattctcat agaaacctgc aaatcacagg cttaaagttg atgcattgac 1080
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<210> 14
<211> 251
<212> PRT
<213> Glycine max
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Arg	Val	Tyr	Ser	Ser	Pro	Ile	Lys	Leu	Gln	Val	Leu	Val	Phe	Ala	Asn	
			20					25					30			
Ile	Asp	Asp	Phe	Lys	Asn	Leu	Leu	Glu	Thr	Leu	Gln	Asp	Val	Ala	Lys	
		35					40					45				
Thr	Phe	Lys	Ser	Lys	Ile	Met	Phe	Ile	Tyr	Val	Asp	Ile	Asn	Asp	Glu	
	50					55					60					
Asn	Leu	Ala	Lys	Pro	Phe	Leu	Thr	Leu	Phe	Gly	Leu	Glu	Glu	Ser	Lys	
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Asn	Thr	Val	Val	Ala	Ala	Phe	Asp	Asn	Ala	Met	Ser	Ser	Lys	Tyr	Leu	
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Leu	Glu	Thr	Lys	Pro	Thr	Gln	Ser	Asn	Ile	Glu	Glu	Phe	Cys	Asn	Asn	
			100					105					110			
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Asp	Asn	Thr	Glu	Ser	Ser	Val	His	Val	Ile	Val	Gly	Lys	Thr	Phe	Asp	
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Pro	Trp	Cys	Ile	Asn	Cys	Glu	Ala	Thr	Ser	Lys	Gln	Val	Glu	Lys	Leu	
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Leu	Leu	Leu	Tyr	Arg	Ala	Asp	Asp	Lys	Ala	Asn	Pro	Ile	Lys	Leu	Ser	
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Thr	Lys	Ser	Ser	Leu	Lys	Glu	Leu	Ala	Ala	Ser	Ile	Asn	Lys	Tyr	Val	
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Lys	Val	Lys	Asn	Gln	Val	Val	Lys	Asp	Glu	Leu						
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<210>	15
<211>	1943
<212>	DNA

<213> Glycine max

<400> 15

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1943

<210> 16

<211> 551

<212> PRT

<213> Glycine max

<400> 16

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Met Arg Ile Leu Val Val Leu Ser Leu Ala Thr Leu Leu Leu Phe Ser
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             20             25             30
Gly Phe Leu Asp Glu Pro Ser Ala Ala Pro Glu His Gly His Tyr His
             35             40             45
Asp Asp Asp Ala Asn Phe Gly Asp Phe Glu Glu Asp Pro Glu Ala Tyr
             50             55             60
Lys Gln Pro Glu Val Asp Glu Lys Asp Val Val Ile Leu Lys Glu Lys
             65             70             75             80
Asn Phe Thr Asp Thr Val Lys Ser Asn Arg Phe Val Met Val Glu Phe
             85             90             95

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Tyr Ala Pro Trp Cys Gly His Cys Gln Ala Leu Ala Pro Glu Tyr Ala
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Ala Ala Ala Thr Glu Leu Lys Gly Glu Asp Val Ile Leu Ala Lys Val
115 120 125
Asp Ala Thr Glu Glu Asn Glu Leu Ala Gln Gln Tyr Asp Val Gln Gly
130 135 140
Phe Pro Thr Val His Phe Phe Val Asp Gly Ile His Lys Pro Tyr Asn
145 150 155 160
Gly Gln Arg Thr Lys Asp Ala Ile Val Thr Trp Ile Gly Lys Lys Ile
165 170 175
Gly Pro Gly Ile Tyr Asn Leu Thr Thr Val Glu Asp Ala Gln Arg Ile
180 185 190
Leu Thr Asn Glu Thr Lys Val Val Leu Gly Phe Leu Asn Ser Leu Val
195 200 205
Gly Pro Glu Ser Glu Glu Leu Ala Ala Ala Ser Arg Leu Glu Asp Asp
210 215 220
Val Asn Phe Tyr Gln Thr Val Asp Pro Asp Val Ala Lys Leu Phe His
225 230 235 240
Ile Asp Pro Asp Val Lys Arg Pro Ala Leu Ile Leu Val Lys Lys Glu
245 250 255
Glu Glu Lys Leu Asn His Phe Asp Gly Lys Phe Glu Lys Ser Glu Ile
260 265 270
Ala Asp Phe Val Phe Ser Asn Lys Leu Pro Leu Val Thr Ile Phe Thr
275 280 285
Arg Glu Ser Ala Pro Ser Val Phe Glu Asn Pro Ile Lys Lys Gln Leu
290 295 300
Leu Leu Phe Ala Thr Ser Asn Asp Ser Glu Lys Leu Ile Pro Ala Phe
305 310 315 320
Lys Glu Ala Ala Lys Ser Phe Lys Gly Lys Leu Ile Phe Val Tyr Val
325 330 335
Glu Met Asp Asn Glu Asp Val Gly Lys Pro Val Ser Glu Tyr Phe Gly
340 345 350
Ile Ser Gly Asn Ala Pro Lys Val Leu Gly Tyr Thr Gly Asn Asp Asp
355 360 365
Gly Lys Lys Phe Val Leu Asp Gly Glu Val Thr Ala Asp Lys Ile Lys
370 375 380
Ala Phe Gly Asp Asp Phe Leu Glu Asp Lys Leu Lys Pro Phe Tyr Lys
385 390 395 400
Ser Asp Pro Val Pro Glu Ser Asn Asp Gly Asp Val Lys Ile Val Val
405 410 415

Gly Asn Asn Phe Asp Glu Ile Val Leu Asp Glu Ser Lys Asp Val Leu
 420 425 430
 Leu Glu Ile Tyr Ala Pro Trp Cys Gly His Cys Gln Ala Leu Glu Pro
 435 440 445
 Ile Tyr Asp Lys Leu Ala Lys His Leu Arg Asn Ile Glu Ser Leu Val
 450 455 460
 Ile Ala Lys Met Asp Gly Thr Thr Asn Glu His Pro Arg Ala Lys Pro
 465 470 475 480
 Asp Gly Phe Pro Thr Leu Leu Phe Phe Pro Ala Gly Asn Lys Ser Phe
 485 490 495
 Asp Pro Ile Thr Val Asp Thr Asp Arg Thr Val Val Ala Phe Tyr Lys
 500 505 510
 Phe Leu Lys Lys His Ala Ser Ile Pro Phe Lys Leu Gln Lys Pro Thr
 515 520 525
 Ser Thr Ser Asp Ala Lys Gly Ser Ser Asp Ala Lys Glu Ser Gln Ser
 530 535 540
 Ser Asp Val Lys Asp Glu Leu
 545 550

<210> 17
 <211> 1565
 <212> DNA
 <213> Triticum aestivum

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 ggcttccccca ccgtgctcct cttcgctcaat ggcaccgagc acgcctacca tggcctccac 240
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1565

<210> 18

<211> 451

<212> PRT

<213> Triticum aestivum

<400> 18

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 20 25 30

Leu Arg Ala Met Gly Ser Ala Val Ala Phe Ala Lys Leu Asp Gly Glu
 35 40 45

Arg Tyr Pro Lys Ala Ala Ala Val Gly Val Lys Gly Phe Pro Thr
 50 55 60

Val Leu Leu Phe Val Asn Gly Thr Glu His Ala Tyr His Gly Leu His
 65 70 75 80

Thr Lys Asp Ala Ile Val Thr Trp Val Arg Lys Lys Thr Gly Glu Pro
 85 90 95

Ile Ile Arg Leu Gln Ser Lys Asp Ser Ala Glu Glu Phe Leu Lys Lys
 100 105 110

Asp Met Thr Phe Val Ile Gly Leu Phe Lys Asn Phe Glu Gly Ala Asp
 115 120 125

His Glu Glu Phe Val Lys Ala Ala Thr Thr Asp Asn Glu Val Gln Phe
 130 135 140

Val Glu Thr Ser Asp Thr Arg Val Ala Lys Val Leu Phe Pro Gly Ile
 145 150 155 160

Thr Ser Glu Glu Lys Phe Val Gly Leu Val Lys Ser Glu Pro Glu Lys
 165 170 175

Phe Glu Lys Phe Asp Gly Lys Phe Glu Glu Thr Glu Ile Leu Arg Phe
 180 185 190

Val Glu Leu Asn Lys Phe Pro Leu Ile Thr Val Phe Thr Glu Leu Asn
 195 200 205

Ser Gly Lys Val Tyr Ser Ser Pro Ile Lys Leu Gln Val Phe Thr Phe
 210 215 220

Ala Glu Ala Tyr Asp Phe Glu Asp Leu Glu Ser Met Val Glu Glu Ile
 225 230 235 240

Ala Arg Ala Phe Lys Thr Lys Ile Met Phe Ile Tyr Val Asp Thr Ala
 245 250 255

Glu Glu Asn Leu Ala Lys Pro Phe Leu Thr Leu Tyr Gly Leu Glu Ser
 260 265 270

Glu Lys Lys Pro Thr Val Thr Ala Phe Asp Thr Ser Asn Gly Ala Lys

275 280 285

Tyr Leu Met Glu Ala Asp Ile Asn Ala Asn Asn Leu Arg Glu Phe Cys
290 295 300

Leu Ser Leu Leu Asp Gly Thr Leu Pro Pro Tyr His Lys Ser Glu Pro
305 310 315 320

Leu Pro Gln Glu Lys Gly Leu Ile Glu Lys Val Val Gly Arg Thr Phe
325 330 335

Asp Ser Ser Val Leu Glu Ser His Gln Asn Val Phe Leu Glu Val His
340 345 350

Thr Pro Trp Cys Val Asp Cys Glu Ala Ile Ser Lys Asn Val Glu Lys
355 360 365

Leu Ala Lys His Phe Ser Gly Ser Asp Asn Leu Lys Phe Ala Arg Ile
370 375 380

Asp Ala Ser Val Asn Glu His Pro Lys Leu Lys Val Asn Asn Ser Pro
385 390 395 400

Thr Leu Phe Leu Tyr Leu Ala Glu Asp Lys Asn Asn Pro Ile Lys Leu
405 410 415

Ser Lys Lys Ser Ser Val Lys Asp Met Ala Lys Leu Ile Lys Glu Lys
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Leu Gln Ile Pro Asp Val Glu Thr Val Ala Ala Pro Asp Asn Val Lys
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Asp Glu Leu
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<210> 19
<211> 1078
<212> DNA
<213> *Triticum aestivum*

<400> 19

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 <211> 294
 <212> PRT
 <213> Triticum aestivum

<400> 20

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 35 40 45
 Ser Ser Lys Phe Leu Pro Ile Ile Lys Glu Thr Ala Lys Ser Phe Lys
 50 55 60
 Gly Lys Leu Leu Phe Val Phe Val Glu Arg Asp Asn Glu Glu Val Gly
 65 70 75 80
 Glu Pro Val Ala Asn Tyr Phe Gly Ile Thr Gly Gln Glu Thr Thr Val
 85 90 95
 Leu Ala Tyr Thr Gly Asn Glu Asp Ala Lys Lys Phe Phe Phe Thr Gly
 100 105 110
 Glu Ile Ser Leu Asp Thr Ile Lys Glu Phe Ala Gln Asp Phe Met Glu
 115 120 125
 Asp Lys Leu Thr Pro Ser Tyr Lys Ser Asp Pro Val Pro Glu Ser Asn
 130 135 140
 Asp Glu Asp Val Lys Val Val Val Gly Lys Ser Leu Asp Gln Ile Val
 145 150 155 160
 Leu Asp Glu Ser Lys Asp Val Leu Leu Glu Ile Tyr Ala Pro Trp Cys
 165 170 175
 Gly His Cys Gln Ser Leu Glu Pro Ile Tyr Asn Lys Leu Ala Lys Tyr
 180 185 190
 Leu Arg Gly Ile Asp Ser Leu Val Ile Ala Lys Met Asp Gly Thr Asn
 195 200 205
 Asn Glu His Pro Arg Ala Lys Pro Asp Gly Phe Pro Thr Ile Leu Phe
 210 215 220
 Tyr Pro Ala Gly Lys Lys Ser Phe Glu Pro Ile Thr Phe Glu Gly Gly
 225 230 235 240
 Arg Thr Val Val Glu Met Tyr Lys Phe Leu Lys Lys His Ala Ala Ile
 245 250 255
 Pro Phe Lys Leu Lys Arg Pro Asp Ser Ser Ala Ala Arg Thr Asp Ser
 260 265 270
 Ala Glu Gly Pro Gly Ser Thr Thr Asp Ser Glu Lys Ser Ser Gly Ser
 275 280 285

Asn Pro Lys Asp Glu Leu
290